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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/728,944	12/08/2003	Kia Silverbrook	ZE009US	9011

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SILVERBROOK RESEARCH PTY LTD  
393 DARLING STREET  
BALMAIN, 2041  
AUSTRALIA

EXAMINER
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DAHIMENE, MAHMOUD

ART UNIT	PAPER NUMBER
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1765

DATE MAILED: 09/19/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/728,944

Applicant(s)

SILVERBROOK, KIA

Examiner

Mahmoud Dahimene

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 08 December 2003.  
2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.  
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-6 is/are pending in the application.  
4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.  
5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.  
6) ☒ Claim(s) 1, 2 and 4-6 is/are rejected.  
7) ☒ Claim(s) 3 is/are objected to.  
8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.  
10) ☒ The drawing(s) filed on 12/8/2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)  
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)  
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 12/8/2003.  
4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_  
5) ☐ Notice of Informal Patent Application (PTO-152)  
6) ☐ Other: \_\_\_\_\_

***Claim Rejections - 35 USC § 103***

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1,2,4,5 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jarrold et al. (US 20020093548) in view of Lebens et al. (US 6474795).

Applicant is claiming a method of fabricating a fluid ejection device comprising the steps of:

forming a plurality of micro-electromechanical fluid ejection devices on a substrate that incorporates drive circuitry such that each device includes a micro-electromechanical actuator that is in electrical contact with the drive circuitry and a fluid ejection member that is positioned on the actuator; forming a plurality of nozzle chamber walls on the substrate to define nozzle chambers such that each fluid ejection member is operatively positioned with respect to a respective nozzle chamber to eject fluid from the nozzle chamber on receipt of an electrical signal from the drive circuitry by the micro-electromechanical actuator to displace the fluid ejection member; depositing a layer of sacrificial material on the substrate to cover the nozzle chamber walls; etching the layer of sacrificial material to define deposition zones for a structural material layer that is to define roof walls of the nozzle chambers and nozzle rims extending from the roof walls to define ink ejection ports in fluid communication with respective nozzle chambers;

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depositing the layer of structural material on the etched layer of sacrificial material to cover the layer of sacrificial material thereby defining the roof walls, the nozzle rims and closing the ink ejection ports, such that the layer of structural material is conformal to the layer of sacrificial material;

planarizing the layer of structural material to open the ink ejection ports; and removing the sacrificial material.

Jarrold discloses an inkjet print head comprising a substrate (page 2, paragraph 22) where a plurality of MEM inkjets are formed (page 1, paragraph 4), the compatibility of CMOS and MEMS processes allows integration of control circuits on the same substrate (page 1, paragraph 4). Each device includes drive circuit, MEM actuator and ink injection cantilever (which reads on fluid ejection member). On one substrate, a plurality of thermal actuator printheads (page 1, paragraph 11) consisting each of cantilevered element residing in an ink chamber with a nozzle through which ink may be ejected from the chamber (page 2, paragraph 22). The ink injection cantilever is operatively positioned with respect to the nozzle chamber to eject ink from the nozzle chamber on receipt of an electrical signal from the drive circuit by the MEM actuator to displace the cantilever (page 1, paragraph 9).

A layer of sacrificial material is deposited to cover the chamber walls (page 3, paragraph 34). The sacrificial material is then etched defining the chamber inner walls and roof (page 3, paragraph 36). A dielectric is conformally deposited on top of the sacrificial layer as a layer of structural material to define the roof walls (page 3, paragraph 35).

Although Jarrold discloses a planarization step providing a flat top surface on the sacrificial layer (page 3, paragraph 34), a difference is noted between applicant's claim 1 and the reference of Jarrold. Jarrold fails to disclose a step where planarization of the structural material layer is performed to open the ink injection ports and removing the sacrificial layer.

Lebens describes an ink jet device where the structural material layer is planarized, and the ink injection ports are opened by etching the structural material through a patterned mask (column 5, line 60).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to modify the process of Jarrold to include the teachings of Lebens to add a planarization step in order to obtain a smooth surface facing the printed media. As to defining the nozzles by patterning the sacrificial layer with a lithography step, or etching the structural material, the method would have amounted to the same number of steps, and the results would have been similar. One of ordinary skill in the art would have been motivated to include a planarization step in order to obtain a smoother surface facing the printed media, and therefor a higher quality printhead.

As to claim 2, another difference is noted between applicant's claim and the reference of Jarrold. Jarrold fails to disclose a CMP step.

Lebens discloses a method where CMP is used for planarization of the structural material (column 6, line 1).

As to claim 4, Jarrold discloses a MEM ink ejection device where a sacrificial layer is used ((column 1, paragraph 15), the cantilever is formed by depositing an oxide layer on the substrate, ((40) figure 3) (page 2, paragraphed 32), next a conductive material layer is deposited to define the heater element of the cantilever which includes the the contacts (30) and (32) that extend off to connect to the control circuit on the device. The heater layer is then patterned and etched (page 3, paragraph 32).

A difference is noted between applicant's claim 4 and the reference of Jarrold. Jarrold fails to disclose the use of a sacrificial material as required by applicant's claim 4. Jarrold discloses a cantilever with a conductor layer on top of an oxide layer, and at this stage, no sacrificial material is used.

Lebens discloses an thermal actuator where the resistive (conductor) material ((104), figures 8,9) is deposited on top of a sacrificial layer (100).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to modify the process of Jarrold to include the step of depositing a conductive layer on top of a sacrificial layer, and then depositing a layer of flexible dielectric material on the heater layer because Lebens illustrates how the conductive layer and the dielectric layer positions can be interchanged, and still providing the function of a thermal actuator. One of ordinary skill in the art would have been motivated to choose the order in which the layers are deposited in order to accomplish the function desired, as long as the thermal and mechanical properties of the layers are properly selected as taught by Jarrold (page 2, paragraphe 21). In this case protecting the conductive layer by a dielectric layer is desirable.

As to claim 5, the deposited elements (34), (36) and (40) (Jarrold, figure 7) partially define the ink ejection member, and the method include the step of etching at least one of the heater and dielectric layers to define the ink ejection member (canitilever).

As to claim 6, method as claimed by Jarrold in which the sacrificial material layer and the layer of dielectric material are deposited and etched so that each micro-electromechanical actuator is an actuator arm that is anchored at one end to the substrate and connected, at an opposite end to the ink ejection member.

***Allowable Subject Matter***

3. Claim 3 objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons inclusion of allowable subject matter; Regarding claim 3, the cited prior art of record taken alone or in combination fail to disclose as suggested a method of fabricating a fluid ejection device comprising the step of etching the layer of sacrificial material to define deposition zones for ink spread prevention rims interposed between the nozzle rims and depositing the layer of

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structural material such that the layer of structural material defines the ink spread prevention rims interposed between the nozzle rims.

It is not obvious to modify the method of Jarrold to include an ink spread prevention rim as described by the applicant, because it is not explicitly included in other references.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mahmoud Dahimene whose telephone number is (571) 272-2410. The examiner can normally be reached on week days from 8:00 AM. to 5:00 PM..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on (571) 272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



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MD

**NADINE G. NORTON**  
**SUPERVISORY PATENT EXAMINER**

A handwritten signature in black ink, appearing to be 'N. Norton', written below the printed name and title.